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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/734,590	12/15/2003	Rainer Autenrieth	038743.52928US	1416

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CROWELL & MORING LLP
INTELLECTUAL PROPERTY GROUP
P.O. BOX 14300
WASHINGTON, DC 20044-4300

EXAMINER	
WILLIAMS, SHERMANDA L	
ART UNIT	**PAPER NUMBER**
1745	

DATE MAILED: 11/16/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/734,590	AUTENRIETH, RAINER	
	Examiner	Art Unit	
	Shermanda L. Williams	1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 December 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-14* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *15 December 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *12/15/2003*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Information Disclosure Statement

The information disclosure statement filed 12/15/2003 has been considered by the examiner.

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Specification

The substitute specification filed 10/21/2004 has not been entered because it does not conform to 37 CFR 1.125(b) and (c) because:

the statement as to lack of new matter under 37 CFR 1.125(b) is missing.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 1-10 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. There are no method steps provided in claims 1-10.

4. Claims 1-10, and 12-14 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

5. The phrase "a predefined desired value" in claim 1 is not defined by the claim. The specification does not provide a standard for ascertaining the requisite value and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. Also, it is unclear what is meant by a "timed manner" as presented in claim 1.

6. The "pause to switch-on ratio" presented in claim 2 in not defined in claim 2.

7. In claim 4 the limitation "within control accuracy of the gas generating system" is indefinite. Neither the claim nor the specification provides insight to the meaning of this claim language. The specification does not provide a standard for ascertaining the requisite value and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

8. The phrase "desired values" in claims 7, 8, 12, 13, and 14 are not defined by the claim. The specification does not provide a standard for ascertaining the requisite value and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

9. The phrases "relatively smaller" and "relatively larger" in claim 9 are not defined by the claim. These are relative terms, which render the claim indefinite. The specification does not provide a standard for ascertaining the requisite value and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

10. Claims depending on claims rejected under 35 USC § 112, second paragraph are also rejected for the same reason.

Claim Rejections - 35 USC § 102

11. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

12. Claims 1, 3, 4, 10, and 11 are rejected under 35 U.S.C. 102(a)/102(e) as being anticipated by Autenrieth et al. (EP 1205341 A2) or US 2002/0057066 A1. Please note US PG Pub 2002/0057066 A1 is an equivalent document to EP 1205341 A2 and is relied upon for translation. Autenrieth et al. (EP 1205341 A2) teaches a method of operating a fuel cell system that comprises switching the fuel cell on and off electrically depending on the available quantity of fuel (paragraph 5). By switching the fuel cell on and off via an electric switch the power output to the load is controlled and the fuel flow within or to the fuel cell is controlled (paragraph 14, 15). The pause to switch-on ratio in claim 1 used to operate the fuel cell is inherently a timing device for switching power off and on from the fuel cell to the load as disclosed in EP 1205341 A2. The control voltage is pulse-width modulated (paragraph 16). The quantity of fuel supplied to the fuel cell is controlled as the pause to switch-on ratio or the ratio of switch-off to switch-on of the electrical switch in the fuel supply control system (paragraph 16). Based on the actual value of the switch-off to switch-on ratio (equates to sufficient fuel or insufficient fuel) the desired value of the switch-off to switch-on is restored. See paragraph 16.

13. With respect to claim 11, the open/close ratio of the connection between the fuel cell and the load being supplied is the ratio of switch-open to switch-close. The ratio of switch-open to switch-close determines when and how long the fuel cell supplies power to the load: A decreased fuel supply relates to a shortened switch-on period. An increased fuel supply relates to a lengthened switch-on period (paragraph 16, 21).

14. With respect to claims 3 and 4, Autenrieth et al. (EP 1205341 A2) teaches the use of a hydrogen gas generating unit or a reformer (paragraph 11, 29) to supply fuel (hydrogen) to the anode side of the fuel cell. The quantity of fuel supplied to the fuel cell is controlled by the pause to switch-on ratio or the ratio of switch-off to switch-on of the electrical switch in the fuel supply control system. The ratio of switch-off to switch-on falls within the accuracy of the generator when the electric switch properly responds to the amount of fuel supplied from the reformer. The fuel supplied to the fuel cell from the fuel gas generator controls whether or not the fuel cell is operable (has adequate fuel) and the pause to switch-on ratio or the ratio of switch-off to switch-on must be set according (i.e. within fuel gas supply accuracy limits) for the system operation.

15. With respect to claim 10, Autenrieth et al. EP 1205341 A2 teaches the method of operating a fuel cell vehicle by switching between the claimed fuel cell method of operation and a battery. The fuel cell supplies power to the fuel cell vehicle depending on the available quantity of fuel. Operating the mobile fuel cell in this manner ensures the electrical power demands onboard the vehicle are supplied and that operation of the fuel cell only occurs when safe fuel levels are established (paragraph 27, 28).

Claim Rejections - 35 USC § 103

16. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

17. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Autenrieth et al. (EP 1205341 A2) or equivalent document US 2002/0057066 A1 relied upon for translation. Autenrieth et al. discloses the method of operating a fuel cell by switching the fuel cell on and off depending on the available quantity of fuel (see abstract).

18. As a result of switching the fuel cell on and off via an electric switch the power output to the load is controlled and the fuel flow within or to the fuel cell is controlled (paragraph 14, 15 of US PG Pub 2002/0057066 A1). The control voltage is pulse-width modulated or timed (paragraph 16). The quantity of fuel supplied to the fuel cell is controlled as the pause to switch-on ratio or the ratio of switch-off to switch-on of the electrical switch in the fuel supply control system (paragraph 16). Based on the actual value of the switch-off to switch-on ratio (equates to sufficient fuel or insufficient fuel) the desired value of the switch-off to switch-on is restored (fuel cell is operable or inoperable). It would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the teachings of Autenrieth et al. EP 1205341 A2 to form a method of controlling fuel supply to the fuel cell system depending on existing fuel levels so that the fuel cell system is only operational during

time periods when the fuel level is at a safe level (paragraph 12). This avoids damaging and failure of the fuel cell system.

19. Autenrieth et al. EP 1205341 A2 does not teach the explicit value of the pause to switch-on ratio or the "switch-on to switch-off ratio".

20. Autenrieth et al. EP 1205341 A2 teaches a switch-open to switch-close ratio in relation to the fuel cell voltage output (paragraph 16). The pause to switch-on ratio or the "switch-on to switch-off ratio" are influenced by the amount of fuel available to the fuel cell. The 10%/90% ratio is not taught explicitly however, the prior art teaches that the "switch-on to switch-off ratio" or pulse frequency of the system should be selected such that there minimal fluctuations in fuel supply to the fuel cell (paragraph 16). It would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the teachings of Autenrieth '413 to establish a pause to switch-on ratio or a "switch-on to switch-off ratio" that allows for minimal transients during operation of the fuel cell. The pause to switch-on ratio or switch-on to switch-off ratio is a recognized results effective variable. It has been held by the courts that optimizing a results effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980)

21. Claims 6, 7, 8, 9, 12, 13, and 14 are rejected under 35 U.S.C. 103(a) as being obvious over Autenrieth et al. (EP 1205341 A2 or equivalent document US 2002/0057066 A1 relied upon for translation) in view of Higashiyama et al. (US 6,890,673 B2). Autenrieth et al. EP 1205341 A2 teaches the control of the operation of a fuel cell by based on the available quantity of fuel to the fuel cell. The electrical switch

10 connecting the fuel cell and the device powered by the fuel cell is switched on or off depending on the fuel level of the fuel cell (see claim 7 of US PG Pub 2002/0057066 A1). The quantity of fuel supplied to the fuel cell is controlled as the pause to switch-on ratio or the ratio of switch-off to switch-on of the electrical switch in the fuel supply control system (Paragraph 16).

22. Autenrieth et al. EP 1205341 A2 does not teach the use of a feedback PID control method (i.e. multiplication of parameter values with correction factors etc.), and it does not teach the use of a damping factor.

23. Higashiyama et al. (Higashiyama) teaches a hydrogen producing apparatus and a power generating system using it. The hydrogen generating apparatus is operated by a flow setting means (timed on-off valves). The flow setting means opens a given supply system during time period T2. The average supply flow to the hydrogen generator in time period T2 becomes the "desired value" (col. 4 lines 4-14).

24. Higashiyama teaches controlling the air or oxygen to the hydrogen generating apparatus by controlling the temperature of the reaction within a preset range (see claim 1). Higashiyama teaches that this control scheme can be applied to various parameters such as blower discharge, variable flow-valve, etc. (see claims 1-4). There is a target temperature value T*, an observed temperature value T, a difference in target temperature and observed temperature T*-T, and a correction value or factor delta Q (col. 14 lines 40-55). The difference in the in target temperature and observed temperature T*-T is normalized with respect to the target Temperature T* and multiplied by a feedback gain 1 and 2 or a damping factor of the proportional control. The control

scheme discussed for the temperature control is applicable to various process parameters to control a selected process output (col. 15 line 66 to col. 16 line 13). The multiplication of correction or damping factor is an obvious step in a control scheme employing PID controllers. As well, the determination of a "new" parameter value using the previous or actual value or desired value is an obvious step within feedback control techniques. When a damping factor value is not explicitly stated in the control scheme it is understood to be 1. Autenrieth et al. EP 1205341 A2 and Higashiyama are analogous art because they are both concerned with controlling a parameter in a process. It would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify Autenrieth et al. EP 1205341 A2 to include Higashiyama's feedback control scheme using the PID control method (to include a correct factor and manipulation of the parameter values) to manage the amount of fuel supplied to the fuel cell in order to obtain a fast response system.

25. Claim 5 is rejected under 35 U.S.C. 103(a) as being obvious over Autenrieth et al. EP 1205341 A2 (or US PG Pub 2002/0057066 A1 relied upon for translation) in view of Merritt et al (US 5,366,821). Autenrieth et al. EP 1205341 A2 teaches the control of the operation of a fuel cell system by based on the available quantity of fuel to the fuel cell. A reformer is used to generate fuel gas for the fuel cell (paragraph 29 of US PG Pub 2002/0057066 A1).

26. Autenrieth et al. EP 1205341 A2 (or US PG Pub 2002/0057066 A1) does not teach that the amount of fuel gas generated or fed to the fuel cell is always smaller than the quantity of fuel that can be converted by the fuel cell.

27. Merritt et al. (Merritt) teaches a fuel cell with improved reactant supply and control system. Merritt teaches the method of defining the fuel utilization ratio of the reactants as the amount of fuel introduced to the fuel cell per unit time divided by the amount of fuel consumed (col. 3 lines 25-34). This indicates that the amount of fuel or the amount of a given reactant supplied to the fuel cell will not be completely consumed by the fuel cell. As well, the reference teaches optimizing the fuel utilization ratio for the limiting reactant to improve fuel cell efficiency (col. 3 lines 47-57). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Autenrieth et al. EP 1205341 A2 in light of the teachings of Merritt and therefore supply fuel or reactants to the fuel cell in an amount less than the fuel cell full capacity in order to improve the fuel cell efficiency (the transient power output of the fuel cell).

28. Claims 6-9 and 12-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Autenrieth et al. EP 1205341 A2 (or US PG Pub 2002/0057066 A1 relied upon for translation) as applied to claim 1 and 11 above, and further in view of Leboe (US 2004/0080297 A1).

29. Autenrieth et al. EP 1205341 A2 (or equivalent document US PG Pub 2002/0057066 A1) does not teach the use of a feedback PID control method (i.e. multiplication of parameter values with correction factors etc.) or

30. Leboe teaches a method for controlling the operation of a hydrogen generator and fuel cell by basic variable manipulation commonly used in process feedback control schemes. A PID controller is used to control the fuel supply to the hydrogen generator

based on measured output parameters (closed loop feedback control scheme) from the associated fuel cell (paragraph 20). The PID controller is based on either a feedback or a feedforward process control scheme. Leboe teaches that the parameter setpoint values within the control scheme may be calculated at discrete intervals and continuously updated or periodically updated (paragraph 22,75, 77). Also, the process parameters may be predetermined or predefined (paragraph 34).

31. It would have been obvious to one having ordinary skill in the art at the time the invention was made to employ the PID controller in the closed loop feedback control scheme of Leboe in the fuel cell system of Autenrieth et al. EP 1205341 A2 (or equivalent document US PG Pub 2002/0057066 A1) to ensure the fuel cell is operative or inoperative depending on the load requirements or fuel levels available for safe and efficient operation of the fuel cell system as taught by Leboe.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shermanda L. Williams whose telephone number is (571) 272-8915. The examiner can normally be reached on Mon.-Thurs. 7 AM - 4:30 PM and alternating Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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SUSY TSANG-FOSTER
PRIMARY EXAMINER